

REMARKS/ARGUMENTS**Claim Objection, 35 USC § 112, second paragraph**

The Examiner objected to claim 13 because of a typographical error. Applicants agree that “wet” should have been “set” and claim 13 has been amended to correct this deficiency.

Rejections of Claims 1, 3 and 7-11 Under 35 USC § 103(a)

The Examiner rejected claims 1, 3 and 7-11 as obvious over U.S. Patent No. 6,392,519 to Ronning (“Ronning”). Regarding claims 1 and 11, the Examiner reasoned, incorrectly we believe, that “Ronning discloses the claimed invention except for the wire being an insulated conductor.” Regarding claim 3, the Examiner reasoned, incorrectly we believe, that “Ronning discloses the claimed invention except for a “box-like” shaped outer core.” Regarding claim 7, the Examiner reasoned, incorrectly we believe, that “Ronning further illustrates in figure 2 that the inner core has recesses.” Regarding claim 8, the Examiner reasoned, incorrectly we believe, that “Ronning further discloses that iron may be used for the material of the inner core and that an alloy may be used for the material of the outer surrounding structure.” Regarding claims 9 and 10, the Examiner reasoned that “...it is known to apply a potting material to encapsulate the winding” and “... a potting material is used to encapsulate the inner coil and core.”

Claims 1 and 11 are Patentable over Ronning:

In the parent application it was pointed out that while Ronning shows the use of potting material 48 to fill an interior space between a ferromagnetic core 14 and an outer mounting cup 22, the inductor of Ronning is quite differently shaped and contained. In fact, the Ronning inductor structure 12 comprises nothing more than or beyond the core 14 of ferromagnetic material and the winding 16 or windings 16 and 18. As explained in the Ronning specification, “core 14 includes, in the illustrated embodiment, a central leg 42, and a pair of opposing outer legs 44, and 46”. (Ronning, column 4, lines 26-28). Thus, loosely speaking, Ronning’s central leg loosely corresponds to Applicants’ claimed “inner core”, and Ronning’s pair of opposing outer legs 44 and 46 loosely corresponds to Applicants’ claimed outer core. Ronning’s opposing outer legs 44 and 46 do not comprise a “topwall and sidewall structure overlying the coil and inner core” as recited in Applicants’ claim 1.

In rejecting claim 1 the Examiner appears to have mistakenly confused the “outer surrounding structure” or mounting cup 22 with Applicants’ claimed “outer core of magnetic

core material". As specified by Ronning, the mounting cup 22 is not formed of a recognized magnetically permeable material. Rather, Ronning specifies that "mounting cup 22 is . . . formed of a material having a high thermal-conductivity, such as aluminum or a copper alloy". (Ronning specification, column 3, lines 31-33). In other words, the recited function of Ronning's outer cup 22 is to conduct heat away from magnetic core 14, and not to complete a magnetic circuit around coils 16 and 18, quite different from the necessary function of Applicants' "outer core of magnetic core material" as set forth expressly in claim 1.

Moreover, since Ronning's magnetic core is defined as the core structure 14 comprising central leg 42, and opposing outer legs 44 and 46, it is important to note that Ronning does not disclose a single magnetic gap, much less "at least two magnetic gaps . . . between ends of the inner core and the opposite inner wall portions of the outer core. Therefore, claim 1 is not suggested by Ronning and is patentably distinct and nonobvious over Ronning. Allowance of claim 1 is requested.

While Ronning does show two coils 16 and 18, Ronning does not show the other requirements of claim 1 as indicated above. Therefore, claim 11 is not suggested by Ronning and is patentably distinct and nonobvious over Ronning. Allowance of claim 11 is requested.

Claim 3 is patentable over Ronning:

Since Ronning's outer cup does not correspond structurally to Applicants' claimed "outer core of magnetic core material", and since the only equivalent magnetic structures of Ronning providing an outer core function are the open legs 46 and 48, Applicants' claim 3, which adds to claim 1 the requirement that the outer core have a rectangular box shape, is not taught or suggested by Ronning. Claim 3 is patentably distinct and nonobvious over Ronning. Allowance of claim 3 is requested.

Claim 7 is patentable over Ronning:

Since Ronning's inner core is central leg 42, it is apparent from Ronning's figure 2 that there are no recesses in central leg 42 for any purpose whatsoever. Thus, Ronning lacks the "recess defined to control inductive characteristic rolloff . . ." in the inner core as expressly set forth in Applicants' claim 7. Claim 7 is patentably distinct and nonobvious over Ronning. Allowance of claim 7 is requested.

Claim 8 is patentable over Ronning:

Claim 8 adds to claim 1 the requirement inter alia that the outer core magnetic material be selected from "a group including MnZn, NiZn, MPP, Ni-Fe, Fe-Al-Si, amorphous

alloys, iron, and iron powder.” Since the Ronning outer cup 22 is not part of the magnetic core 14, Ronning’s teaching of aluminum or a copper alloy as being suitable materials for the “thermally-conductive” cup 22 is not a teaching or suggestion that the cup be formed of magnetic material or that it form any part of the magnetic circuit of the Ronning structure. The Ronning cup 22 is a heat-transfer cup, not a magnetic core. Claim 8 is patentably distinct and nonobvious over Ronning. Allowance of claim 8 is requested.

Claims 9 and 10 are patentable over Ronning:

While Ronning unquestionably shows potting material for thermal transfer purposes, Ronning does not disclose or suggest the structure of claim 1 from which claims 9 and 10 depend. Therefore, claims 9 and 10 are each patentably distinct and nonobvious over Ronning. Allowance of claims 9 and 10 is requested.

Rejection of Claims 2 and 4 Under 35 USC § 103(a)

The Examiner rejected claims 2 and 4, erroneously we believe, upon a combination of Ronning and U.S. Patent No. 6,252,486 to Wolf (“Wolf”). The Examiner reasoned, erroneously for the reasons outlined above, that Ronning discloses the claimed invention except for the flattened shape of the coil and core. The Examiner reasoned, erroneously we believe, that Wolf discloses a low profile magnetic component comprising planar magnetic components such as windings, in order to realize a volume-restricted space and that one skilled in the art would be motivated to combine the teachings of Ronning and Wolf to realize a device of Applicants’ claim 1 wherein the coil and the inner core have a flattened shape (claim 2); and, wherein the outer core has a rectangular box-shape and the coil and inner core have a flattened shape (claim 4).

As explained above, it is Applicants’ position that the Ronning outer cup 22 does not correspond to or suggest the Applicants’ claimed “low profile inductor wherein the outer core has a rectangular box shape”.

As previously explained in proceedings on the parent application, Wolf proposes forming an inductive device by stacking and interconnecting planar layers of spiral traces formed on printed circuit board surfaces. Wolf does not have an inner core separate from the outer core but rather uses an “E” shaped lower core and an “I” shaped upper core. There are no discernable magnetic gaps between the Wolf E and I pieces forming the core structure. Moreover, there is no suggestion in Wolf that the inner core segment 15 could be “flattened” to suggest the flattened inner core shape required by Applicants’ claims 2 and 4. Since Wolf does not make up for the deficiencies noted above in connection with Ronning, a

combination of Ronning and Wolf does not meet or suggest the subject matter of either claim 2 or claim 4. Claims 2 and 4 are patentably distinct over a combination of Ronning and Wolf, and allowance of claims 2 and 4 is requested.

Rejection of Claim 5 Under 35 USC § 103(a)

The Examiner rejected claim 5, erroneously we believe, over a combination of Ronning and U.S. Patent No. 6,285,272 to Boytor, et al. (“Boytor”). Applicants’ claim 5 adds to the claim 1 combination a requirement that the terminal ends of the coil have outwardly exposed flat contact surfaces to facilitate surface mounting. For the reasons advanced above, Applicants’ disagree with the Examiner’s reasoning that Ronning discloses the claimed invention except for the coil ends having contact surfaces to facilitate surface mounting.

As noted during proceedings in the parent application, Boytor shows a low profile inductive component in which a coil of small gauge wire (e.g. 24 gauge) includes terminal conductors 33 separating outwardly away from ends of the coil body in order to be affixed to conductive soldering pads 19 formed on opposite ends of a non-magnetic carrier body. These conductive ends 33, being distal from the coil 32, do not contribute to the inductive energy storage function of the coil, and therefore fail to meet the claim 5 language specifying “terminal ends of the coil”. As exemplified by Figure 4 of the present application, terminal ends of the conductors forming the coil are “flattened” to provide contact surfaces. There is no teaching or suggestion in Boytor that the small 24 gauge wires are flattened prior to being bonded to the conductive soldering pads 19. Rather, Boytor teaches that the ends 33 are “... press fit against the soldering pads 19 to ensure that the ends will be soldered to the lands on the PCB 20” (Boytor specification, column 4, lines 12-14). In other words, the Boytor ends 33 are too insubstantial to be soldered to the PCB without the mechanical assistance of the soldering pads 19. The Boytor coil ends 33 are too flimsy to be flattened and provide for direct reliable connection to the PCB, unlike the subject matter of claim 5. Accordingly, Applicants believe that claim 5 is patentable over the combination of Ronning and Boytor. Allowance of claim 5 is requested.

Rejection of Claim 6 Under 35 USC § 103(a)

Claim 6, depending from claim 5, adds the limitation that the flattened coil ends are coated with “an antioxidant material not containing lead.” The Examiner rejected claim 6, erroneously we believe, upon a combination of Ronning, Boytor and European Patent No. 1032001 to Basteres, et al. (“Basteres”). For the reasons given above, Applicants believe that

the Examiner erred in reasoning that “Ronning in view of Boytor et al. disclose the claimed invention except for coating the coil ends with an antioxidant.” Basteres appears to disclose that a spiral copper trace forming an inductive element is coated with a thin gold layer in order to protect the copper from oxidation. While this may be so, Basteres does not make up for the deficiencies in teaching of Ronning and Boytor noted above. Claim 6 is believed to be patentably distinct over the combination of Ronning, Boytor and Basteres. Allowance of claim 6 is requested.

Rejection of Claims 21-23 Under 35 USC § 103(a)

The Examiner rejected claims 21-23, erroneously we believe, upon a combination of Ronning, Wolf and Boytor. Claim 21 is an independent claim directed to the disclosed preferred embodiment of the present application. The Examiner erred, we assert, in reasoning that Ronning includes an outer magnetic structure which the Examiner erroneously calls out as a “magnetic cup” (Office action of July 28, 2004, page 6, line 15), apparently referring to the thermally-conductive, nonmagnetic outer cup 22 discussed and distinguished hereinabove. At this point it is very important to note that nowhere in the Ronning disclosure have we been able to find any description or suggestion that the cup 22 is a “magnetic cup”. Rather, the two “high thermal-conductivity” materials suggested for the cup 22, aluminum or a copper alloy, are not shown by the Examiner to be magnetic materials of the type used for inductor/transformer core structures. Accordingly, it is the position of Applicants that Ronning fundamentally fails to teach or suggest the claimed

“low profile box-shaped outer core of magnetic material including continuous topwall and sidewall portions and having opposite inner wall segments facing polar ends of the coil and inner core such that at least two magnetic gaps exist between ends of the inner core and inner wall segments of the outer core”

as called out and required by claim 21.

Moreover, Wolf doesn’t show an inner core having a generally flattened shape sized to fit within the open volume of the generally flattened helical coil. Finally, Boytor does not show flattened coil ends. Accordingly, the combination of Ronning, Wolf and Boytor does not teach or suggest the subject matter of claim 21, and it is patentably distinct over the combination advanced by the Examiner. Allowance of claim 21 is requested.

Claims 22 and 23 depend from claim 21 and add further limitations thereto. In regard to claim 22 Ronning does not disclose an adhesive for maintaining the core 14 in place.

Rather, it is positioned by the potting material 48 and conformal material 38. In regard to claim 23, Wolf does not show or suggest a flattened helical coil, but rather teaches interconnection of a series of flat spiral coils defined on surfaces of printed circuit boards. Wolf fails to suggest the subject matter of claim 23. Claims 22 and 23 therefore define patentable subject matter. Allowance of claims 22 and 23 is requested.

Rejection of Claims 12-20 and 24, 35 USC § 103(a)

The Examiner's sole reasoning in rejecting these method claims is that "claims 12-20 and 24 are method counterparts to product claims 1-11 and 21-23 and method steps are therefore inherent for constructing an inductor as claimed by the inventor." (Office action of July 28, 2004, page 8, lines 14-15.) Since Applicants have demonstrated that the product claims are patentable over the prior art applied by the Examiner, and since there is no other evidence of record in this application supporting rejection of claims 12-20 and 24, allowance of these claims is requested.

Summary of Communication with Examiner

On September 7, 2004, David B. Harrison, Reg. No. 27445, a patent attorney consulting on behalf of Applicants' assignee, Tyco Electronics Corporation, in this matter, left a telephone message with Examiner Poker asking for clarification concerning entry of the preliminary amendment of February 27, 2004 in this continuation application because of a lack of clarity on this point in the PAIR record. Examiner Poker's email reply is set forth as follows:

----- Original Message -----

From: "Poker, Jennifer"
To: (David Harrison, email address)
Sent: Wednesday, September 08, 2004 7:30 AM
Subject: 10/743,843

"Mr. Harrison.

I reviewed the office action summary as you had mentioned in the voicemail you left me. The date I indicated at the top was for the filing date of the application. I did consider and examine the claims which were included in the preliminary amendment. The office action makes reference to all original and new claims.

If you have any further questions, feel free to call me."

Examiner Poker

Applicants have concluded from this response that the preliminary amendment was entered by the USPTO in its entirety and have framed and presented the present response to the Office action of July 28, 2004, accordingly.

Conclusion

Examination and early allowance of the claims of this application, as amended herein, is respectfully requested. If, however, there are any outstanding issues which can be usefully discussed by telephone, the Examiner is asked to call the undersigned.

Respectfully submitted,

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